For all questions, answer E. NOTA means none of the above answers are correct.

1. Let $\cos(4x) = A\cos^4(x) + B\cos^3(x) + D\cos^2(x) + E\cos(x) + F$. Compute A+B+D+E+F.
   A. -1
   B. 0
   C. 1
   D. 2
   E. NOTA

2. Given $y = 0.75\sin(2x - 1)$; Let A = the magnitude of the phase shift of y; B = the amplitude of y and C = the period of y. Find $A^2 - B + C \div \pi$.
   A. -1
   B. -0.5
   C. 0
   D. 0.5
   E. NOTA

3. Find: $\lim_{x\to\infty}\left(\frac{x+1-\cos^2(x)}{2x^2}\right)$
   A. -1
   B. 0
   C. 1
   D. Does not exist
   E. NOTA

4. What is the acute angle of rotation (in degrees) needed to eliminate the xy-term from the equation:
   $7x^2 + \sqrt{3}\,xy + 6y^2 - 4x + 5y - 8 = 0$?
   A. 15
   B. 30
   C. 45
   D. 60
   E. NOTA

5. Which one of the following is one of the fifth roots of 1? Note: Answers are in degrees.
   A. $\cos(216) + i\sin(216)$
   B. $\cos(192) + i\sin(192)$
   C. $\cos(108) + i\sin(108)$
   D. $\cos(60) + i\sin(60)$
   E. NOTA

6. Let A= the absolute value of b such that $0.5r = 5 + b\cos(\theta)$ is a cardioid. Let B = the number of leaves in the polar curve $r = 2\sin(3\theta)$. Find: A – B.
   A. -1
   B. 3
   C. 4
   D. 7
   E. NOTA

7. What is the equivalent of π/32 radians?
   A. 5°6'25"
   B. 5°15'12"
   C. 5°37'30"
   D. 5°45'45"
   E. NOTA

8. Find the rectangular coordinates of the polar point (-3, 150°).
   A. $(\frac{3\sqrt{3}}{2}, -\frac{3}{2})$
   B. $(-\frac{3}{2}, \frac{1}{2})$
   C. $(\frac{3}{2}, 3\sqrt{3})$
   D. $(3\sqrt{3}, -\frac{3}{2})$
   E. NOTA

9. In ΔDEF, d=6, D=30° and F=45°. Find f.
   A. $6\sqrt{2}$
   B. $3\sqrt{2}$
   C. $2\sqrt{2}$
   D. $\sqrt{2}$
   E. NOTA

10. In which quadrant is the terminal side of the angle 2008°
    A. I
    B. II
    C. III
    D. IV
    E. NOTA

11. Determine: $1 + \sin(x) + \sin^2(x) + \sin^3(x) + \sin^4(x) + \ldots$ where $x = 45^\circ$.
    A. $4+\sqrt{2}$
    B. $2+\sqrt{2}$
    C. $2+2\sqrt{2}$
    D. $4+2\sqrt{2}$
    E. NOTA

12. Given ΔABC with a=5, b=12, c=13 and angle $A = \Theta$. Find $\csc(2\Theta) - \cot(\Theta)$
    A. $-\frac{119}{120}$
    B. $-\frac{67}{169}$
    C. $-\frac{37}{60}$
    D. $-\frac{137}{156}$
    E. NOTA

13. A cosine curve has a frequency of 1/3, which of the following could be the curve:

    I. $y = 3\cos(x - 3)$
    II. $y = 2\cos(\frac{1}{3}x+4)$
    III. $y = \frac{1}{3}\cos(2x - 4)$

    A. I only
    B. III only
    C. I and II only
    D. II and III only
    E. NOTA

14. In ΔPQR, p=8, q=9 and $R=60^\circ$. Find the area of ΔPQR.
    A. $18\sqrt{3}$
    B. $9\sqrt{3}$
    C. $18\sqrt{2}$
    D. $9\sqrt{2}$
    E. NOTA

15. In ΔXYZ, x=4, y=5 and $Z=60^\circ$. Find z.
    A. $2\sqrt{3}$
    B. $\sqrt{15}$
    C. $3\sqrt{2}$
    D. $\sqrt{21}$
    E. NOTA

16. Simplify: $\sin(x + 45^\circ) - \cos(x + 30^\circ)$ into the form $a*\sin(x) + b*\cos(x)$. Find a – b.
    A. $\frac{1-\sqrt{3}}{2}$
    B. $\frac{-1+\sqrt{3}}{2}$
    C. $\frac{1+\sqrt{3}}{2}$
    D. $\frac{-1-\sqrt{3}}{2}$
    E. NOTA

17. Find the roots for $y = \cos^2(x)+\frac{1}{2}\sin(x)-\frac{1}{2}$ on the interval $(0, 360^\circ)$.
    A. $\{210^\circ, 330^\circ\}$
    B. $\{90^\circ, 210^\circ, 330^\circ\}$
    C. $\{90^\circ, 240^\circ, 300^\circ\}$
    D. $\{90^\circ, 210^\circ, 270^\circ, 330^\circ\}$
    E. NOTA

18. Find the Cartesian equation for the polar graph: $r = \frac{3}{4-\cos(\Theta)}$.
    A. $16x^2+15y^2-6y-9=0$
    B. $15x^2+16y^2-6x-9=0$
    C. $16x^2+9y^2-4x-3y-12=0$
    D. $9x^2+16y^2-3x-4y-12=0$
    E. NOTA

19. Which of the following angles is coterminal with $\frac{275\pi}{3}$ radians?
    A. 30°
    B. 120°
    C. 240°
    D. 300°
    E. NOTA

20. For the graph y = 3sin(x) – 6cos(x). Let A = the amplitude of y, let B = the period of the graph of y in degrees. Find $B \div A^2$.
    A. 8
    B. 4
    C. 2
    D. 1
    E. NOTA

21. Given $\sin(x) = \frac{2}{7}$, find tan(2x). Assume the terminal side of x lies in the first quadrant.
    A. $\frac{6\sqrt{3}}{41}$
    B. $\frac{9\sqrt{5}}{41}$
    C. $\frac{12\sqrt{5}}{41}$
    D. $\frac{18\sqrt{3}}{41}$
    E. NOTA

22. Find the polar coordinates equivalent to the Cartesian coordinates $(-5, -5\sqrt{3})$.
    A. (10, 210°)
    B. (5, 240°)
    C. (10, 240°)
    D. (5, 210°)
    E. NOTA

23. Simplify: $\left(\frac{2cis(48)}{-3cis(66)}\right)^5$.
    A. $\frac{32}{729}i$
    B. $\frac{8}{81}i$
    C. $\frac{16}{81}i$
    D. $\frac{32}{243}i$
    E. NOTA

24. Myron is a discus thrower. He is able to spin his body around at a speed of 2 revolutions per second. Given he spins around with the discus in his hand (and his arm is 3 feet long) – at what speed does the discus leave his hand? Assume the discus travels in a circular path before being released and neglect the width of Myron's body. Give your answer in yards per minute.
    A. 4π
    B. 12π
    C. 72π
    D. 240π
    E. NOTA

25. Suppose you select a number at random on the interval (-360, 360) and that number represents a degree measure. What is the probability that you select a number where the sine of its angle, measured in degrees, is less than -0.5?
    A. 1/2
    B. 5/12
    C. 1/3
    D. 1/4
    E. NOTA

26. If cos(x) = a/b, what is tan(x)? Assume $a \neq b \neq 0$.
    A. $\frac{\sqrt{b^2 - a^2}}{a}$
    B. $\frac{\sqrt{b^2 - a^2}}{b}$
    C. $\frac{a}{\sqrt{b^2 - a^2}}$
    D. $\frac{b}{\sqrt{b^2 - a^2}}$
    E. NOTA

27. Using the half-angle formula, find sin(22.5°).

A. $\sqrt{\frac{1}{2}-\sqrt{2}}$

B. $\frac{1}{2}\sqrt{2-\sqrt{2}}$

C. $\frac{1}{2}\sqrt{4-\sqrt{2}}$

D. $\frac{1}{2}\sqrt{5-\sqrt{3}}$

E. NOTA

28. What is the range of the cosecant function?

A. $(-\infty,-1]\cup[1,\infty)$

B. $(-\infty,-1)\cup(1,\infty)$

C. $(-1,1)$

D. $[-1,1]$

E. NOTA

29. Given sinh(x) = $\frac{e^x - e^{-x}}{2}$, what is csch(ln9)?

A. 42/9

B. 9/42

C. 9/40

D. 40/9

E. NOTA

30. Compute the cosine of the acute angle formed by <-5, 3, 0> and <1, 5, 7>.

A. $\frac{\sqrt{51}}{37}$

B. $\frac{\sqrt{102}}{51}$

C. $\frac{\sqrt{73}}{21}$

D. $\frac{\sqrt{133}}{46}$

E. NOTA